Universidad del País Vasco
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EKONOMIA ETA ENPRESA FAKULTATEA
FACULTAD DE ECONOMÍA Y EMPRESA

Statistics and Data Analysis

January 14, 2022

GADE

PROBLEM 1 (2 POINTS)

We have data on the travel allowances (per diems) received by the employees of a company when they have to travel for their work.

Travel allowances or per diems in €	Number of employees in Company A
80	10
60	5
20	5
15	5
10	15

a) **(0.5 points)** Calculate the mean, variance and quartiles of the per diems received in Company A.
b) **(0.5 points)** In Company B, the average per diems is 36€ and its variance is 599. Which of the two companies shows a greater relative dispersion with respect to their mean?
c) **(1 point)** In another company, Company C, the average per diems received by their employees is 34€ and its standard deviations is 7€. In what interval can you guarantee that the per diems received by 60% of the employees of Company C will be?

PROBLEM 2 (2 POINTS)

The following data were collected from 20 companies in the technology sector in Gipuzkoa:

		Monthly wages (€)		
		500-1000	1000-2500	2500-6000
Number of employees	10-30	6	1	0
	30-50	2	3	0
	50-100	0	0	10

a) **(0.4 points)** What is the average monthly earnings in companies with up to 50 employees?
b) **(0.4 points)** Knowing that the mean salary is 2568.16€ and its variance is 2489669.42 and the average number of employees is 49.5 with a variance of 593, calculate the regression line that explains salaries as a function of the number of employees and explain in a sentence the meaning of the coeficients that you have obtained.
c) **(0.4 points)** Use the regression line in b) to predict the salary of a company with 110 employees. How reliable is this prediction? Justify your answer.
d) **(0.4 points)** What percentage of the variance of the wages is explained by the number of employees in the company?
e) **(0.4 points)** Calculate the regression line that explains the number of employees as a function of wages.

PROBLEM 3 (2 POINTS)

A company studied the evolution of prices in euros of three components used in their production chain (the rightmost column shows the Consumer Price Index with year 1 as reference period):

YEAR	A	B	C	CPI
1	3	4	1	100%
2	4	6	1.5	103%
3	5	6.5	2	107%
4	4.5	7	2.5	109%
5	7	4	3	120%

a) **(0.5 points)** Calculate simple indeces to study the evolution of component prices taking year 1 as the reference period.
b) **(0.5 points)** Calculate a joint index of the evolution of prices using the Sauerbeck formula and taking year 1 as base period.
c) **(0.5 points)** Knowing that each piece contains 5 units of component A, 10 of component B and 15 units of component C, calculate the joint price indices for the three components for year 5 taking as reference period year 1 and using the three Laspeyres, Paasche and Fisher indeces.
d) **(0.5 points)** In constant terms, what has been the percentual change in production cost of a single piece from year 1 to year 5?

PROBLEM 4 (2 POINTS)

In a campus restaurant, customers may to choose between two sides for their lunch: rice or fries. 30% of the all the customers order a soda with their lunch, 60% order water and the rest do not have any drink with their lunch. Further we know that, among those that order a soda, 75% get fries; among those that order water, %25 of them get fries; among those that order not drinks, 20% of them order fries.

a) **(0.5 points)** What is the probability of a customer ordering fries?
b) **(0.5 points)** Is the fact of choosing fries independent from the drink choice of a customer? Justify your answer.
c) **(0.5 points)** What is the probability of a customer that has ordered fries order soda for lunch?
d) **(0.5 points)** What is the probability of a customer who has not ordered a soda choose fries over rice?

PROBLEM 5 (2 POINTS)

Consider the joint probability distribution:

		X	
		1	2
Y	0	0.80	0.1
	1	0.0	0.1

a) **(0.5 points)** Compute the marginal probability distributions of X and Y and their corresponding expected values and variances.
b) **(0.5 points)** Compute the covariance and correlation coeficient of X and Y. Interpret the results.
c) **(0.5 points)** Compute the expected value and variance for the variable W=X+Y.
d) **(0.5 points)** Compute the expected value for the variable Z=XY.